



September 9, 2011

Garry Rhodes, Building Commissioner
Office of Community Development
Town of Lexington
1625 Massachusetts Avenue
Lexington, MA 02420

Dear Mr. Rhodes:

As required by the approvals previously issued for Lexington Technology Park (the "Approvals"), the undersigned hereby submits on behalf of the Shire Human Genetic Therapies, Inc. ("Shire") the attached report entitled "LTP Sound Level Compliance Assessment dated September 9, 2011" (the "Report").

The Report was prepared by Acentech in order to determine compliance of Shire's facilities at Lexington Technology Park with the Lexington Noise By-Law ("Noise By-Law") and the requirements of the Approvals with respect to sound.

The Report demonstrates that sound from the facility is less than 10dB above ambient, and thus is in compliance with the overall sound level requirements of the Noise By-Law. However, the Report also indicates that, at one location, there is a tonal condition that slightly exceeds the levels allowed under the Noise By-Law. Shire is already designing mitigation measures for this tonal condition, and expects to test those measures within the next two weeks.

Please don't hesitate to contact us if we can provide you with anything further.

Yours truly,

A handwritten signature in blue ink, appearing to read "Jeffrey L. Fullerton".

Jeffrey L. Fullerton, INCE Bd. Cert., LEED AP
Director, Architectural Acoustics Group

Encl.: Lexington Technology Park Sound Level Compliance Assessment Report

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Lexington Technology Park
Sound Level Compliance Assessment
September 9, 2011

General Description

As a condition of the Amended Special Permit for Building 300 by the Board of Appeals on October 14, 2010, Lexington Technology Park is required to perform an assessment to confirm compliance of the facility sound levels at the site with the Town of Lexington Noise Regulation. This report summarizes the sound level goals, the measured sound level results, and our analyses of these data.

Purpose

This report summarizes the results from the sound measurements performed to assess the operating sound levels from the facilities of the Lexington Technology Park at the representative locations along the property line with the adjacent residences when existing building mechanical equipment was operating in a condition simulating a warm summer night. The measurements were performed on August 4th between the hours of 2:00 am and 3:00 am.

Using these measurements, sound levels along the property line were analyzed to determine compliance with the Town of Lexington Noise By-Law.

Town of Lexington Noise By-Law

Section §80-3 of the Town of Lexington Noise By-Law (a copy of which is attached as Exhibit A) states that a condition of noise pollution results when:

a broadband sound source raises the noise level by 10 or more dBA above the ambient noise; or a tonal sound source raises its octave band noise level by three decibels or more above the adjacent octave band levels. These threshold levels are identical to those in the Massachusetts Division of Air Quality Control (DAQC) Policy 90-001 (2001).

Consistent with the DAQC Policy, the sound levels to be used for the compliance assessment will be the L_{eq} sound levels, which represent the energy equivalent average sound levels during each measurement period.

LTP Ambient Sound Levels for the Assessment

The ambient sound levels along the property line of the LTP, established by our report of the Ambient Sound Level Assessment dated June 16, 2010, have been accepted by the Town. Table 1 summarizes the ambient sound levels at these locations.

TABLE 1: Summary of Ambient Sound Levels around the LTP. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	AMBIENT SOUND LEVEL ($L_{p_{amb}}$)
A	Property line behind 34 Shade Street	42
B	Property line behind 50 Shade Street	42
C	Property line behind 72 Shade Street	41
D	Edge of Parking lot at end of Patriot Way	46
E	On Shade Street, Front of 29 Shade Street	42
F	On Shade Street, Front of 40 Shade Street	42

These ambient sound levels ($L_{p_{amb}}$) are to be used in the application of the Town of Lexington Noise By-law for the assessment of the compliance of sound emissions from the LTP facilities.

Sound Level Assessment Locations

For this study, the sound levels were measured simultaneously along the property line, in the neighborhood and near the manufacturing equipment. The specific measurement locations are shown in Figure 1 and are described below.

Property Line Measurements (Positions A thru D)

The sound level measurements conducted at Positions A thru C were observed by personnel who logged notes of the audible activities that occurred during the measurement period. The personnel had their equipment set up prior to 1:50am and remained in place until after 3:00am.

The sound level measurement conducted at Position D was unattended during the measurement period. This monitor was set up prior to 1:30am and remained in place until after 3:20am.

Residential Measurements (Positions E & F)

Similar to the property line measurements, sound level measurements at Positions E&F were started prior to 1:45am and ran until 3:00am.

Route 2 Measurement (Position Z)

An additional sound level meter, which recorded only the overall sound levels, was placed on the south side of the Building 300 and was left unattended. This monitor measured the sound of the LTP facilities and traffic on Route 2 and Interstate 95. These data are also presented in the following charts and results.

Instrumentation

All sound level measurements were performed using precision sound level meters (SLM) that met the Type 1 provisions in ANSI S1.4-1983 or IEC 804 (1985) and the provisions in ANSI S1.11 or IEC 225. The specific models included are listed in Table A-1 of the Appendix.

All instrumentation was calibrated in the field prior to and following the series of measurements (see Table A-2 in the Appendix). The meters were calibrated with a single handheld calibrator that produced 94.0 dB at 1,000 Hz. For all of the meters, the change in calibration from before and after the tests was less than ± 0.1 dB.

For the stationary measurements at Positions A thru F, the microphone height was approximately 5 feet above ground. All of the meters included the manufacturer's windscreen over the microphone to minimize the influence of any wind on the measurements.

Personnel

The personnel performing the sound level measurements are listed in Table A-3 in the Appendix. Personnel were familiar with the equipment and the standardized techniques associated with performing the sound level measurements.

Weather and Ground Cover Conditions

Local weather conditions during the event period were well suited for the sound level measurements. The conditions are recorded and reported by the weather reporting station at Hanscom Air Force Base at 2:56am as listed in Table 2 below.

TABLE 2: Summary of Weather Conditions.

TEMP	DEW PT.	HUMIDITY	PRESSURE	VISIBILITY	WIND DIR.	WIND SPEED	CONDITIONS
62-63 °F	60 °F	90-93%	29.86 in.	10.0 mi.	Calm	Calm	Partly Cloudy

Details about the ground cover conditions at each measurement location are described in Table A-4 in the Appendix. All of the ground cover at the sites was clear of any precipitation and snow.

Schedule

The sound level measurement team assembled within the Shire B300 parking lot at 12:30am on August 4th. The team field calibrated the numerous sound level meters using the same calibrator. Garry Rhodes from the Town of Lexington and two witnesses from the community were present and observed the calibrations and start up process. At about 1:30am, the team split up and proceeded to their various positions for the sound level measurements, which began at 2:00am and continued until 3:00am.

The measurement team reassembled in the Shire B300 parking lot at about 3:30am to recalibrate the sound level meters and pack up the equipment.

Shire Mechanical System Operating Conditions

The weather forecast for the night of measurements was to be cooler than a typical summer night, when the LTP mechanical systems would be operating at a higher capacity. To compensate for the

lower exterior temperatures, the Shire facilities personnel assisted in performing two actions to ensure the exterior equipment would be operating at or near full capacity. First, the fans of the cooling towers at 125 Spring Street, Building 400 and Building 500 were set to operate at full capacity. Second, to increase the capacity of the B300 East side HVAC chiller, the temperatures within the Shire facilities were raised in the early evening to create a heat load for the air conditioning systems to cool. As 2am approached, the temperature settings within the buildings were reset, so that the B300 air conditioning systems were operated under a nearly full load condition. This operating condition lasted until about 2:45am, as the B300 East side chiller automatically returned to a lower capacity when the interior of the building had been returned to normal temperature levels. From that point on, the B300 East side HVAC chiller was operating at a level more consistent with the exterior temperatures of that evening.

During the measurements, it was noted that the B300 West side chiller was operating at less than full capacity. This resulted in lower sound level from the northwest side of the B300 rooftop.

Lexington Technology Park Sound Level

The sound level measurements provided extensive data from the measurement period. The sound levels that were measured at each minute included the average equivalent sound level (L_{eq}) and several statistical sound levels, including the L_{10} , L_{50} and L_{90} . The L_{eq} sound level was used as the sound level of greatest interest for the assessment. This sound level represents the energy equivalent average sound level of each measurement period.

The sound level meter at Position F in front of 40 Shade Street did not record the sound level data from the measurement period. It was not clear whether equipment failure or operator error caused this issue. As a result, this sound level data is not available for comparison below.

Measured Sound Level Data

A graph of the L_{eq} sound level measured at each minute over the course of the period from 1:45am to 3:00am is shown in Figure 2. Of the measured L_{eq} sound level data, we excluded the two sound levels recorded from Position E at 2:54am and 2:57am, which resulted from cars driving along Shade Street by the sound level monitor.

Given that the B300 East side HVAC chiller at Shire was not able to stay operating at the full capacity for the final 15 minutes of the hour, we analyzed the data based on the loudest 30 measurements of the measurement period. This approach excludes the quieter periods when the lower capacity operation of the East side HVAC chiller is evident in the data on Figure 2. The arithmetic averages of the 30 loudest L_{eq} sound levels data from the 2:00am to 3:00am period are shown in Table 3.

Table 3 indicates that the measured sound level results at the 5 positions are within the 10 dBA allowance above the ambient levels.

We note the lack of measured sound level data at Position F in Table 3. Despite this, it is useful to note that the nearby sound level at Position E is only 4 dBA above the ambient and that the other monitor positions between Position F and the facilities (Position A and B) are also less than the 10 dBA above the ambient sound level. For this reason, we are of the opinion that this position also meets the Town's Noise requirement.

TABLE 3: Average of 30 Loudest L_{eq} Sound Levels measured between 2:00am and 3:00am. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	AMBIENT SOUND LEVELS dBA	AVERAGE OF 30 LOUDEST L_{eq} SOUND LEVELS (L_{eq}) dBA
A	Property line behind 34 Shade Street	42	51
B	Property line behind 50 Shade Street	42	49
C	Property line behind 72 Shade Street	41	48
D	Edge of Parking lot at end of Patriot Way	46	49
E	On Shade Street, Front of 29 Shade Street	42	46
F	On Shade Street, Front of 40 Shade Street	42	N/A
Z	South side of Building 300 along Route 2	-	50

Tonal Assessment of Ambient Sound Level Data

The Massachusetts Department of Environmental Protection defines a tonal sound by the following description:

“...a tonal sound source raises its octave band noise level by three decibels or more above the adjacent octave band levels.”

We analyzed the octave band sound level data from the 5 measurement locations for which we have recorded data, using this criterion. The results indicated that the sound levels at Positions A and D along the property line registered a handful of sporadic instances of tonal conditions. At Position A, a tonal condition occurred in the 500 Hz octave band center frequency, which can be seen in Figure 3. The sound level at 500 Hz exceeded the tonal condition by 0.3 dB. This tone was observed to be the compressor sounds of the B300 East side HVAC chiller, which emits a sound that varies between the 500 Hz and 630 Hz third octave band frequencies. This tonal condition will require mitigation of the compressor tone to comply with the Town’s Noise requirements.

As with the ambient measurements, Position D exhibited 9 instances when tonal conditions occurred during the measurements. The tonal conditions occurred at the 63 Hz octave band center frequency. The frequency of this tonal condition was consistent with the findings from the prior Ambient Assessment and is not consistent with any other measurements of the mechanical systems at the Shire facilities. For these reasons, this tonal condition is believed to be caused by heavy truck traffic on nearby highway.

The tonal analysis indicates that Positions B, C and E did not register any tonal conditions.

The monitor placed on the south side of Building 300 did not record spectral data and therefore the tonal condition could not be assessed.

Based on Position A, the tones from the B300 East side HVAC chiller compressors will need to be further mitigated to comply with the Town’s Noise requirement.

Adjustment for B300 West Side Chillers Sound Levels

As described above, it was noted that the B300 West side chillers were operating at a reduced capacity. To adjust for this reduced operating level, we have calculated an adjusted sound level that reflects the B300 West side chillers operating at full load. To perform this calculation, we have used the modeled sound levels of the B300 West side chillers and other equipment from the June 16, 2010 Ambient Sound Level Assessment. We added these data to the L_{eq} sound level averages above to determine an adjusted sound level average with the facility under a full capacity condition. It is useful to note that this will overestimate the influence of the B300 West side chillers, since these modeled sound level data include not only the sound of the B300 West side chillers operating at full load, but also the B300 transformers and exhaust fans, which were operating on August 4th, along with the construction generators/water pump, which are no longer on the construction site. That is, modeling the sound emission in this fashion double counts the sound from the B300 transformers and exhaust fans, and counts the sound emissions from some construction equipment that is no longer at the site. The contribution of these in the modeled data overestimates the influence that the lower capacity of the B300 West side chillers would have presented in the measurements on August 4th.

TABLE 4: Summary of Operating Equipment Sound Levels from the Computer Model. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	AVERAGE OF 30 LOUDEST MEASURED L_{eq} SOUND LEVELS (L_{eq})	B300 WEST SIDE CHILLERS AND OTHER EQUIPMENT MODELED SOUND LEVELS ($L_{p_{model}}$)	ESTIMATED LTP SOUND LEVEL ($L_{p_{amb}}$)
A	Property line behind 34 Shade Street	51	42	51
B	Property line behind 50 Shade Street	49	41	50
C	Property line behind 72 Shade Street	48	44	50
D	Edge of Parking lot at end of Patriot Way	49	43	50
E	On Shade Street, Front of 29 Shade Street	46	36	47
F	On Shade Street, Front of 40 Shade Street	-	35	-

These estimated LTP sound levels ($L_{p_{amb}}$) demonstrate that even after adjusting for the B300 West side chillers as described above, the measured LTP sound levels comply with the Town of Lexington Noise By-law.

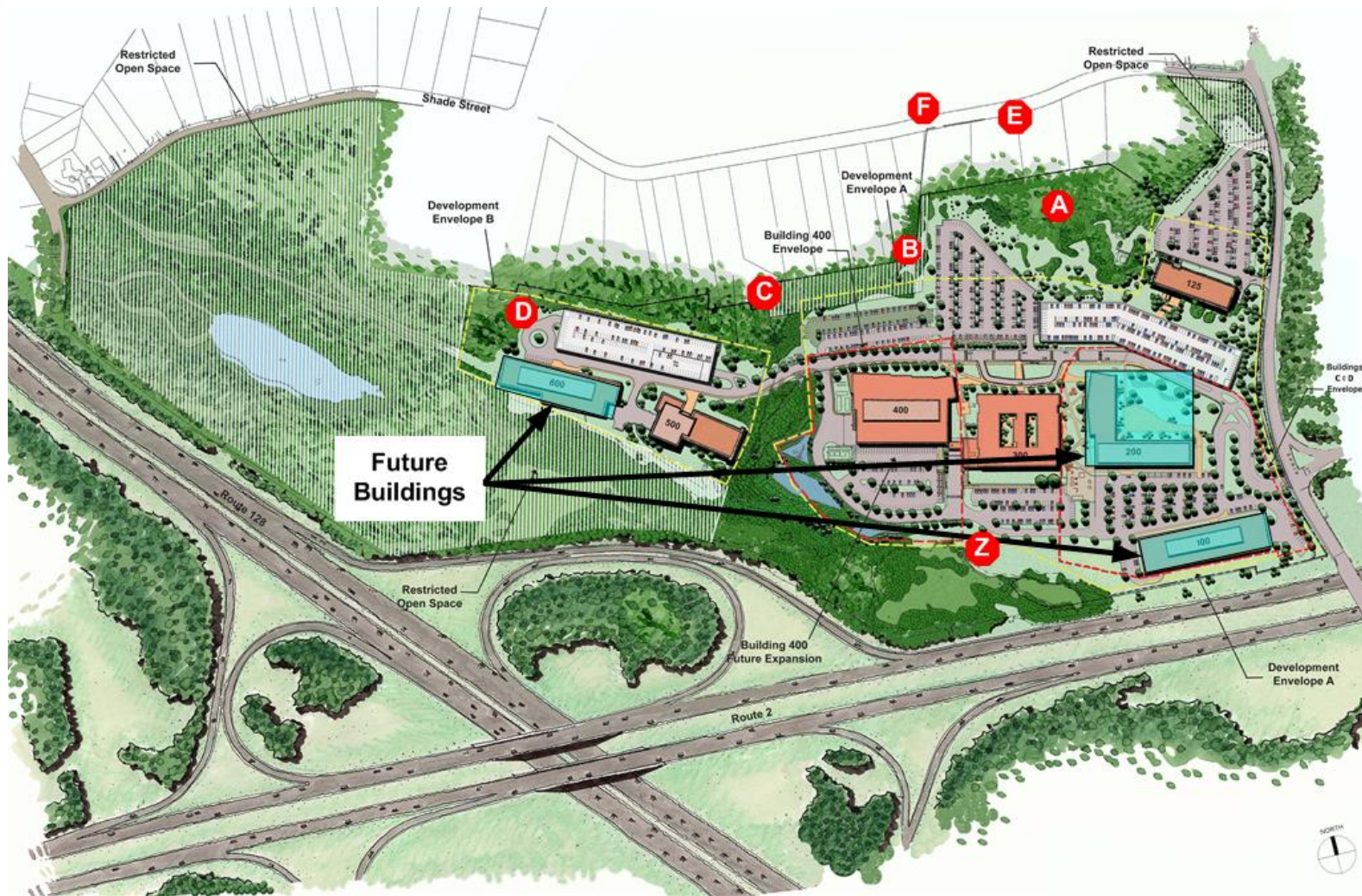


FIGURE 1: Sound level measurement locations (denoted A through F). Location Z was included on the Route 2 side of Building 300. (All locations are approximate.)

APPENDIX

Exhibit A

Chapter 80 of the Code of Lexington, Section 80-3, from the Town of Lexington web site, <http://ci.lexington.ma.us/> , accessed on June 16, 2010. --

NOISE POLLUTION

The condition resulting when: a broadband sound source raises the noise level by 10 or more dBA above the ambient noise; or a tonal sound source raises its octave band noise level by three decibels or more above the adjacent octave band levels. These threshold levels are identical to those in the Massachusetts Division of Air Quality Control (DAQC) Policy 90-001 (2001).

TABLE A-1: Summary of Measurement Equipment. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	SOUND LEVEL METER MODEL	SERIAL NUMBER	MOST RECENT NIST CALIBRATION
A	Property line behind 34 Shade Street	Rion NA-28	1260174	6/10/2011
B	Property line behind 50 Shade Street	Rion NA-28	680886	6/30/2011
C	Property line behind 72 Shade Street	Rion NA-28	680887	6/10/2011
D	Edge of Parking lot at end of Patriot Way	Rion NA-27	701306	3/15/2011
E	On Shade Street, Front of 29 Shade Street	Rion NA-27	570343	6/30/2011
F	On Shade Street, Front of 40 Shade Street	Rion NA-27	121706	1/5/2011
Z	South side of Shire B300	Rion NL-31	610346	5/23/2011

TABLE A-2: Summary of Measurement Calibration. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	SOUND LEVEL METER MODEL	CAL. LEVEL PRIOR	CAL. LEVEL AFTER
A	Property line behind 34 Shade Street	Rion NA-28	94.0 dB @ 1kHz	94.1 dB @ 1kHz
B	Property line behind 50 Shade Street	Rion NA-28	94.0 dB @ 1kHz	93.9 dB @ 1kHz
C	Property line behind 72 Shade Street	Rion NA-28	94.0 dB @ 1kHz	94.0 dB @ 1kHz
D	Edge of Parking lot at end of Patriot Way	Rion NA-27	94.1 dB @ 1kHz	94.1 dB @ 1kHz
E	On Shade Street, Front of 29 Shade Street	Rion NA-27	94.0 dB @ 1kHz	94.0 dB @ 1kHz
F	On Shade Street, Front of 40 Shade Street	Rion NA-27	*	*
Z	South side of Shire B300	Rion NL-31	94.0 dB @ 1kHz	94.0 dB @ 1kHz

* Calibration level measurements for this equipment were not available.

TABLE A-3: Summary of Personnel. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	PERSONNEL	FIRM
A	Property line behind 34 Shade Street	Tom McGraw	Acentech
B	Property line behind 50 Shade Street	Alicia Wagner	Acentech
C	Property line behind 72 Shade Street	Robert Berens	Acentech
D	Edge of Parking lot at end of Patriot Way	Unattended	-
E	On Shade Street, Front of 29 Shade Street	Carl Rosenberg	Acentech
F	On Shade Street, Front of 40 Shade Street	Sam Clapp	Acentech
Z	South (Route 2) side of Shire B300	Unattended	-

TABLE A-4: Summary of Ground Conditions. A diagram of locations is shown in Figure 1.

ID	DESCRIPTION	GROUND CONDITIONS
A	Property line behind 34 Shade Street	Tall grasses and short trees
B	Property line behind 50 Shade Street	In the woods with foliage and fallen leaves
C	Property line behind 72 Shade Street	In the woods with foliage and fallen leaves
D	Edge of Parking lot at end of Patriot Way	Dirt and weeds under the SLM tripod with paved parking lot nearby
E	On Shade Street, Front of 29 Shade Street	Mulched area beside roadway
F	On Shade Street, Front of 40 Shade Street	Plantings along the side of the driveway

Figure 2 - LTP Sound Level Assessment

L_{EQ} Sound Levels at Positions A-F, August 4th 1:45am to 3:00am

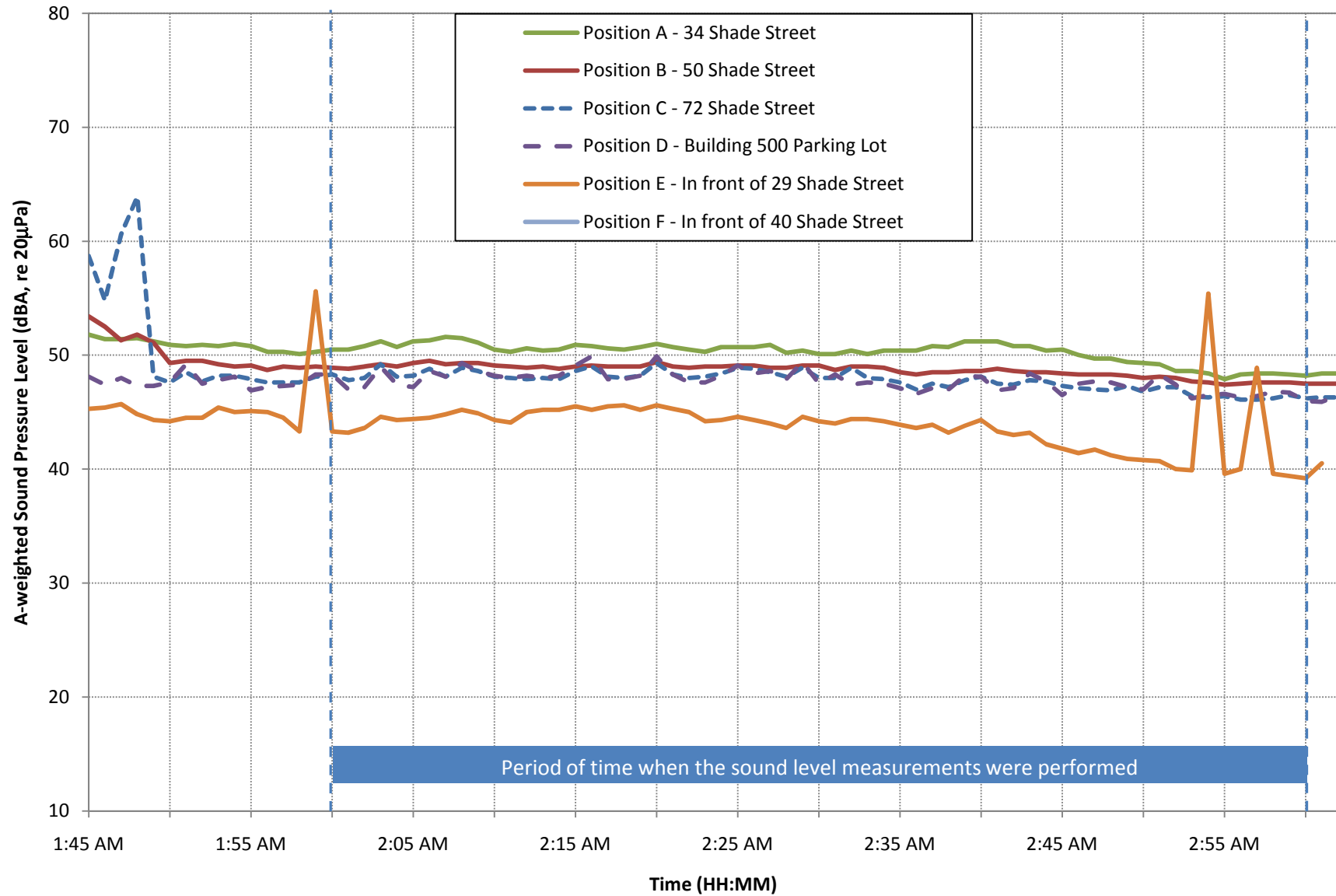


Figure 3 - LTP Sound Level Assessment
L_{EQ} Sound Levels with tonal conditions, August 4th

